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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.               | CONFIRMATION NO. |
|--|-------------|----------------------|-----------------------------------|------------------|
| 10/829,136   | 04/21/2004  | Hec-hwan Choc        | 8116-1 (PL0026/US)                | 5461             |
| 22150  | 7590        | 09/26/2007           |                                   |                  |
| F. CHAU & ASSOCIATES, LLC<br>130 WOODBURY ROAD<br>WOODBURY, NY 11797 |             |                      | EXAMINER<br>DHINGRA, RAKESH KUMAR |                  |
|  |             |                      | ART UNIT                          | PAPER NUMBER     |
|  |             |                      | 1763                              |                  |
|  |             |                      | MAIL DATE                         | DELIVERY MODE    |
|  |             |                      | 09/26/2007                        | PAPER            |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

|                              |                               |                             |  |
|------------------------------|-------------------------------|-----------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/829,136 | Applicant(s)<br>CHOE ET AL. |  |
|                              | Examiner<br>Rakesh K. Dhingra | Art Unit<br>1763            |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2007.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 3 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 4/21/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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***DETAILED ACTION***

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/8/07 has been entered.

***Claim Objections***

Claim 1 is objected to because of the following informalities:

Line 16 of the claim recites "to one b of the lower electrode", wherein "b" appears to be redundant and may be deleted.

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 1 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In this case, amended claim 1 recites "main frequency is 10 MHz to 15 MHz" which is not described in the specification, which instead discloses "the main power supply 30 supplies a main power

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having a frequency of 13.56MHz” (page 9, line 9). For the purpose of examination on merits this limitation is interpreted as “main frequency is 13.56 MHz”.

Appropriate correction is required.

Claim 3 is also rejected being dependent upon claim 1.

### ***Response to Arguments***

Applicant's arguments filed 7/19/2007 have been fully considered but they are not persuasive as explained hereunder.

Applicant has amended claim 1 by adding new limitation “wherein the bias frequency is several MHz to several hundred KHz and the main frequency is 10MHz to 15MHz”.

**Claims 1, 3 are presently pending and active.**

Applicant argues that neither Donohoe does not disclose claimed range of frequencies, nor Aoki disclose or suggest that the bias frequency is several MHz to several hundred KHz and the main frequency is 10MHz to 15MHz, further Aoki is also silent regarding bias voltage and any relationship between bias and main frequencies.

Examiner responds that Donohoe teaches that generators 31, 32, 33 can have different frequency outputs that are mixed and supplied to lower electrode 102 (for example Figure 4). Further, Aoki teaches that processing parameter like deposition rate is related to the relative frequencies of the first and second high frequency power supplied to the lower electrode (Figure 5). It would be obvious to select frequencies of the bias and the main power in Donohoe's apparatus, in view of teachings of Aoki to obtain desired process parameters. Thus Donohoe in view of Aoki teach claim 1 limitations and the same is rejected

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under 35 USC 103 (a) as explained below. Further, claim 3 has also been rejected under 35 USC 103 (a) as explained below.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**Claims 1, 3 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Donohoe et al (US Patent No. 6,309,978 B1) in view of Aoki et al (US PG PUB 2003/0049558).**

Regarding Claim 1: Donohoe et al teach a plasma chamber 101 (Figure 4) comprising a lower electrode 102 and an upper electrode 103, and used for etching/deposition comprising:

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a multi-frequency RF source 114 connected to lower electrode 102 (Column 5, lines 20-38). Donohoe et al further teach that the multi-frequency source 114 (per Figure 6) includes three frequency generators 31, 32, 33 (like main, bias and auxiliary power generators) and which provide discrete (predetermined) frequency and discrete power (predetermined amplitude) levels (Figure 7 and Column 6, lines 14-17). Donohoe et al also teach that apparatus further includes a mixer 37 which combines the output signals of three frequency generators 31, 32, 33 and provides output signal 30 to the lower electrode 102. Donohoe et al also teach that generators 31, 32, 33 can provide discrete as well as a spectrum of frequencies and power levels (implies voltages also). Further, since the three generators 31, 32, 33 can supply different frequencies, the bias frequency can be lower than the main frequency. Donohoe et al additionally teach that as an example the three generators 31, 32, 33 may have output frequencies of 3.95 MHz, 4.00 MHz and 4.05 MHz respectively [for example, column 6, lines 5-65].

Though Donohoe et al do not teach first, second and third impedance matching circuits connected to the mixer, use of impedance matching circuits for impedance matching between RF source and the plasma is known in the art, as per example given hereunder.

Aoki et al teach a plasma apparatus (Figures 1C, 14A) that includes a plasma reaction container 502 and upper electrode 103 to which RF power is supplied. Aoki et al further teach that the apparatus includes three power sources 110A, 110B, 801 (like main, bias and auxiliary power supplies) and three corresponding matching networks 112A, 112B and 802 whose output power of predetermined frequencies and amplitudes is synthesized (mixed) and supplied to upper electrode 103. Aoki et al also teach that separate matching circuits can be placed with each RF power source (paragraphs 0104-0111 and 0533 – 0537).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use matching networks between the three power sources and the mixer as taught by Aoki et

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al in the apparatus of Donohoe et al to enable impedance matching between three power sources and the plasma chamber.

Further, Though, Donohoe et al in view of Aoki et al do not explicitly teach that the bias frequency is several MHz to several hundred KHz and the main frequency is 10MHz to 15MHz, the dependence of process limitations upon frequency of RF power applied to plasma electrode is known in the art.

For example, Aoki et al also teach that frequency of power supplied is directly related to process limitation like deposition rate, and where the main frequency f1 is 10 MHz (which touches the claimed frequency range of 10-15 MHz) and the bias frequency f2 is 6 MHz (which meets the claimed frequency range of several hundred KHz to several MHz) {for example, Figure 5 and paragraphs 0314-0319}.

Thus, it would be obvious to optimize the bias power frequency and the main power frequency in the apparatus of Donohoe et al, in view of teachings of Aoki et al to obtain desired processing parameters.

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Rakesh K. Dhingra



Karla Moore  
Primary Examiner  
Art Unit 1763